

## **AMENDMENTS TO THE DRAWINGS**

Please add new Figure 6 to include a showing of “the method” of the claimed invention. The drawing amendments are described in the application as originally filed and discussed below. No new matter has been added as antecedent support can be found in originally filed Claim 1 and in the originally filed text on pages 1 and 2 (Brief Summary of the Invention), for example.

## **REMARKS / ARGUMENTS**

### **Status of Claims**

Claims 1-26 are pending in the application. Claims 1-26 stand rejected. Applicant has amended Claims 1 and 23, and has canceled Claims 24-25, leaving Claims 1-23 and 26 for consideration upon entry of the present Amendment.

Applicant respectfully submits that the rejections under 35 U.S.C. §101, 35 U.S.C. §112, second paragraph, 35 U.S.C. §102(b), and 35 U.S.C. §103(a), have been traversed, that no new matter has been entered, and that the application is in condition for allowance.

These amendments and accompanying remarks were not presented earlier because Applicant did not fully appreciate the nature of the Examiner's position until the Applicant was advised in more detail of the position by the final rejection, which introduced the Finnigan and Kamen references.

The claim amendments presented herein, which Applicant respectfully requests entry thereof, should require only a cursory review by the Examiner as they merely include clarifying language.

### **Drawing Objections**

The drawings are objected to for reasons relating to the showing of every feature of the invention specified in the claims. The Examiner maintains that "A figure showing the method is required."

While Applicant respectfully disagrees that a figure showing "the method" is necessary for an understanding of the claimed invention, as such a method is clearly delineated by the text of the specification and claims, Applicant has nonetheless, in an effort to advance this case to issue, provided herewith new Figure 6, which depicts a flowchart that shows "the method".

No new matter has been added as antecedent support for Figure 6 may be found in the application as originally filed, such as in the language of Claim 1 and in the text on

pages 1 and 2 (Brief Summary of the Invention), for example.

Accordingly, Applicant respectfully requests entry of Figure 6, and reconsideration and removal of this objection.

### Rejections Under 35 U.S.C. §101

Claims 1-15, 17-26, stand rejected under 35 U.S.C. §101 for reasons relating to the claimed invention allegedly not providing a concrete, useful and tangible result. In the Examiner's Paragraph 8 of the Final Action Paper, "The Examiner respectfully submits, under current PTO practice, that the claimed invention does not recite a *tangible result*. The claims merely recite *an abstract mathematical algorithm*." (Emphasis in the original).

Appellant respectfully traverses this rejection for the following reasons.

In accordance with the Official Gazette Notice of November 22, 2005:

'The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a Sec. 101 judicial exception, in that the process claim must set forth *a practical application* of that Sec. 101 judicial exception to produce *a real-world result*. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had "no substantial practical application."). "[A]n application of a law of nature or mathematical formula to a . . . process may well be deserving of patent protection." Diehr, 450 U.S. at 187, 209 USPQ at 8 (emphasis added); see also Corning, 56 U.S. (15 How.) at 268, 14 L.Ed. 683 ("It is for the discovery or invention of *some practical method or means of producing a beneficial result or effect, that a patent is granted . . .*"). In other words, the opposite meaning of "tangible" is "abstract." (Emphasis added).

Applicant has amended Claim 1 to now recite, inter alia:

"...*estimating the volume of* the third or more three-dimensional shape of *the*

*object from the images of the object* by means of triangular surfaces of each of the facets having known vertex point coordinates, *thereby making available to X-ray imagery an estimation of the volume of the three-dimensional object.”*

No new matter has been added as antecedent support may be found in the application as originally filed, such as at page 6, lines 8-9, for example.

Here, Applicant clearly identifies that *a practical application* of the claimed invention is directed to X-ray imagery, and that *a real-world result produced* is an estimation of the volume of an object from images of the object, which one skilled in the art would recognize would be valuable for determining the size (volume) of an abnormal growth showing on an X-ray film.

Accordingly, Applicant respectfully submits that the claimed invention does recite *a tangible result* in that it recites *a practical application* to produce *a real-world result*, and therefore respectfully requests reconsideration and withdrawal of this rejection, which Applicant considers to be traversed.

### **Claim Objections**

Claims 24 and 25 are objected to for various informalities.

Applicant has canceled Claims 24 and 25, thereby obviating this objection.

### **Double Patenting**

The Examiner comments that should Claim 23 be found allowable, Claim 25 will be objected to as being a substantial duplicate thereof.

Applicant has canceled Claim 25, thereby obviating this objection.

### **Rejections Under 35 U.S.C. §112, Second Paragraph**

**I.** Claims 1-15, 17-26 stands rejected under 35 U.S.C. §112, second paragraph, as being allegedly incomplete for omitting steps between the tessellating and calculating, such omission amounting to a gap between the steps.

**II.** Claims 23 and 25 stand rejected under 35 U.S.C. 112, second paragraph,

as being allegedly incomplete for omitting the steps of calculating density.

**III.** Claim 24 stands rejected under 35 U.S.C. 112, second paragraph, as being allegedly incomplete for omitting steps referred to but not listed.

**IV.** Claims 21, 25 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant traverses these rejections for the following reasons.

**Regarding I.**

Applicant respectfully submits that where the specification provides general guidelines as to the scope of the invention such that one of ordinary skill in the art would know what was meant, the subject matter of the invention would have been described and supported in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Applicant believes the present specification and claims satisfy that burden.

Applicant has amended Claim 1 to now recite, inter alia:

“...estimating the volume of the third or more three-dimensional shape of the object from the images of the object *by means of triangular surfaces of each of the facets having known vertex point coordinates*, thereby making available to X-ray imagery an estimation of the volume of the three-dimensional object.”

No new matter has been added as antecedent support may be found in the application as originally filed, such as at page 4, lines 7-9, for example. Dependent claims inherit all of the limitations of the parent claim.

Here, Applicant clarifies that the estimating of the volume is by means of triangular surfaces, the coordinates of whose vertex points being known. The actual equation or computer algorithm that may be used in the calculation is well within the purview of one skilled in the art, especially one skilled in the technical art of mathematics and computer science, is not intended to be a limiting element of the claimed invention, and is not necessary to include since it is already well known to one skilled in the art.

For example, the tessellated surface formed from the triangular facets may be

viewed as approximating a sphere, since the claimed invention is directed at *estimating* the volume, not calculating the volume with utmost precision. As such, one skilled in the art will appreciate that the known vertices will enable the surface area of each triangle to be calculated, which in turn will enable the total surface area to be calculated, which in turn will enable the volume to be calculated, since the total surface area of a sphere defines the radius of the sphere ( $\text{Area} = 4\pi r^2$ ), and the radius defines the volume ( $\text{Volume} = \frac{4}{3}\pi r^3$ ), at least for purposes of *estimating the volume*, which is commensurate with the scope of the claims.

As a further example, an exemplary algorithm for determining in a more general sense the volume of a closed tessellated object in a CAD file using triangular facets may be found on the internet at <http://www.math.niu.edu/~rusin/known-math/95/volume.poly>, which presents in a 1995 publication from a newsgroup participant the type of algorithm that was well known to one skilled in the art at the time the instant invention was made.

In the claimed invention, Applicant is not claiming the well known equation or algorithm, but instead is claiming an iterative approach to create second and third rank points that progressively subdivide the segments of the base facets to more closely match the contour of the object being studied. Nowhere in the prior art does Applicant find such a disclosure.

In view of the foregoing, Applicant respectfully submits that the claimed subject matter is described in such a manner that reasonably conveys to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Accordingly, Applicant respectfully requests the Examiner to reconsider and withdraw this rejection, which Applicant considers to be traversed.

**Regarding II.**

Applicant submits that where the claims define patentable subject matter with a reasonable degree of particularity and distinctness, the claims should be allowed. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as may be desired. Claims should not be rejected if the expression selected by Applicant satisfies the statutory requirements. In

viewing a claim for compliance with 35 U.S.C. §112, second paragraph, the claim as a whole must be considered to determine whether the claim apprises one of ordinary skill in the art of its scope and, therefore, serves the required notice function. MPEP 2173.02. (Emphasis in the original).

Applicant has canceled Claim 25, and has amended Claim 23 to now recite, inter alia:

“...wherein subsequent to the calculation of the estimated volume of the object, the distribution of the density of the object in space is calculated.”

No new matter has been added as antecedent support may be found in the application as originally filed, such as at page 3, lines 6-7, for example.

The Examiner remarks that the steps for calculating density are missing.

In respectful disagreement with the Examiner, Applicant submits that it is not the density of the object that is being calculated, but the distribution of the density, which one skilled in the art would appreciate may be accomplished by applying a distribution function to the intensity of the features defining the object in the images being studied.

In view of the foregoing, Applicant respectfully submits that the claimed subject matter is described in such a manner that reasonably conveys to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention, defined the claimed subject matter with a reasonable degree of particularity and distinctness, and therefore respectfully requests reconsideration and withdrawal of all rejections under 35 U.S.C. §112, second paragraph, which Applicant considers to be traversed.

**Regarding III.**

Applicant has canceled Claim 24, thereby obviating this rejection.

**Regarding IV.**

At the outset, Applicant notes that the Examiner refers to Claims 21 and 25 as including the term “density”, where the record shows that it is Claims 23 and 25 that include the term “density”. Accordingly, Applicant responds with reference to Claims 23 and 25.

For at least the reasons set forth above Regarding II, Applicant respectfully submits that the rejection to Claim 23 has been obviated (Applicant has canceled Claim 23), and that the rejection to Claim 25 has been overcome (Applicant presents reasoning set forth above as to how the claimed invention is directed to the distribution of the density of the object, how one skilled in the art would appreciate what the scope of Applicant’s invention was, and therefore submits that the term “density” would not be ambiguous to one skilled in the art).

Furthermore, the Examiner rejects Claims 25 by remarking that the term “density” is ambiguous, but does not provide any clarification as to what the ambiguity is or what is causing the ambiguity. In the event that the Examiner maintains this rejection, Applicant respectfully requests that the finality of the office action be removed, and that the Examiner provide further clarification as to what the ambiguity is, thereby providing Applicant with an appropriate opportunity to more specifically respond to this rejection.

**Rejections Under 35 U.S.C. §102(b)**

Claims 1-3, 7-14, 17-23, 25-26 stand rejected under 35 U.S.C. §102(b) as being anticipated by Finnigan et al. (U.S. Patent No. 5,345,490, hereinafter Finnigan).

Applicant traverses this rejection for the following reasons.

Applicant respectfully submits that “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, *in a single prior art reference.*” *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). Moreover, “[t]he identical invention must be shown in as complete detail as is contained in the \*\*\* claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir.

1989). Furthermore, the single source must disclose all of the claimed elements “arranged as in the claim.” Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 716, 223 U.S.P.Q. 1264, 1271 (Fed. Cir. 1984). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. Titanium Metals Corp. v. Banner, 778 F.2d 775, 780, 227 U.S.P.Q. 773, 777 (Fed. Cir. 1985).

Applicant has amended Claim 1 to now recite, *inter alia*,

“...creating second rank points adapted to the contour of the object *by dividing the segments so as to constitute a second three-dimensional shape closer to the contour of the object than the first shape*, the creation of each second rank point resulting in the creation of at least two new facets and at least three new segments;

*defining third or more rank points adapted to the contour of the object by iteratively dividing each new segment into subsegments, so as to represent a third or more three-dimensional shape closer to the contour of the object than the second three-dimensional shape*, the creation of the third or more rank points resulting in the creation of at least two additional new facets and at least three additional new segments; and

*estimating the volume* of the third or more three-dimensional shape of the object from the images of the object *by means of triangular surfaces of each of the facets having known vertex point coordinates*, thereby making available to X-ray imagery an *estimation of the volume of the three-dimensional object.*”

No new matter has been added, as set forth above.

Dependent claims inherit all of the limitations of the parent claim.

In respectful disagreement with the Examiner, Applicant finds Finnigan to disclose a method and apparatus for converting CT data into finite element models (Abstract), and to be absent the disclosure of each and every element of the claimed invention arranged as claimed.

More specifically, Applicant finds Finnigan to be absent any disclosure of “creating second rank points adapted to the contour of the object *by dividing the*

*segments so as to constitute a second three-dimensional shape closer to the contour of the object than the first shape*, the creation of each second rank point resulting in the creation of at least two new facets and at least three new segments”, and the Examiner has not stated with specificity where such a disclosure may be found in Finnigan.

Additionally, Applicant finds Finnigan to be absent any disclosure of “defining third or more rank points adapted to the contour of the object *by iteratively dividing each new segment into subsegments, so as to represent a third or more three-dimensional shape closer to the contour of the object than the second three-dimensional shape*, the creation of the third or more rank points resulting in the creation of at least two additional new facets and at least three additional new segments”, and the Examiner has not stated with specificity where such a disclosure may be found in Finnigan.

Furthermore, Applicant finds Finnigan to be absent any disclosure of “estimating the volume of the third or more three-dimensional shape of the object from the images of the object by means of triangular surfaces of each of the facets having known vertex point coordinates, thereby making available to X-ray imagery an estimation of the volume of the three-dimensional object.”

In comparing Finnigan with the claimed inveniton, Applicant finds Finnigan to be deficient in any disclosure of modifying the facets of a tessellated surface to more closely match the contour of the object being studied.

Accordingly, Applicant submits that Finnigan does not disclose all of the claimed elements arranged as in the claim, and absent anticipatory disclosure in Finnigan of each and every element of the claimed invention arranged as in the claim, Finnigan cannot be anticipatory.

In view of the amendment and foregoing remarks, Applicant submits that Finnigan does not disclose each and every element of the claimed invention arranged as claimed and therefore cannot be anticipatory. Accordingly, Applicant respectfully submits that the Examiner’s rejection under 35 U.S.C. §102(b) has been traversed, and requests that the Examiner reconsider and withdraw of this rejection.

**Rejections Under 35 U.S.C. §103(a)**

Claims 4-6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Finnigan et al. (U.S. Patent No. 5,345,490) in view of Kamen et al. (U.S. Patent No. 5,905,500, hereinafter Kamen).

Applicant traverses these rejections for the following reasons.

Applicant respectfully submits that the obviousness rejection based on the References is improper as the References fail to teach or suggest each and every element of the instant invention in such a manner as to perform as the claimed invention performs. For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). The Examiner must meet the burden of establishing that all elements of the invention are taught or suggested in the prior art. MPEP §2143.03.

Additionally, Applicant submits that dependent claims inherit all of the limitations of the parent claim and any intervening claims, and that a claim dependent upon an allowable claim is also allowable.

Claims 4-6 are dependent claims, and for at least the reasons set forth above regarding the allowability of the parent claim, Applicant submits that claims depending from an allowable claim are allowable. Additionally, Applicant submits that Kamen falls wholly short of curing the deficiencies of Finnigan.

In view of the foregoing, Applicant submits that the References fail to teach or suggest each and every element of the claimed invention and are therefore wholly inadequate in their teaching of the claimed invention as a whole, fail to motivate one skilled in the art to do what the patent Applicant has done, fail to offer any reasonable expectation of success in combining the References *to perform as the claimed invention performs*, and discloses a substantially different invention from the claimed invention, and therefore cannot properly be used to establish a *prima facie* case of obviousness. Accordingly, Applicant respectfully requests reconsideration and withdrawal of all rejections under 35 U.S.C. §103(a), which Applicant considers to be traversed.

Applicant has amended the claims for presentation in a better form that more clearly reflects Applicant's invention. The claim amendments should only require a cursory review by the Examiner.

In light of the foregoing remarks and amendments, Applicant respectfully submits that the proposed amendments and arguments comply with 37 C.F.R. §1.116 and should therefore be entered, and with their entry that the Examiner's rejections under 35 U.S.C. §101, 35 U.S.C. §112, second paragraph, 35 U.S.C. §102(b), and 35 U.S.C. §103(a), have been traversed, and that the application is now in condition for allowance. Such action is therefore respectfully requested.

The Commissioner is hereby authorized to charge any additional fees that may be required for this amendment, or credit any overpayment, to Deposit Account No. 50-2513.

In the event that an extension of time is required, or may be required in addition to that requested in a petition for extension of time, the Commissioner is requested to grant a petition for that extension of time that is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to the above-identified Deposit Account.

Respectfully submitted,

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